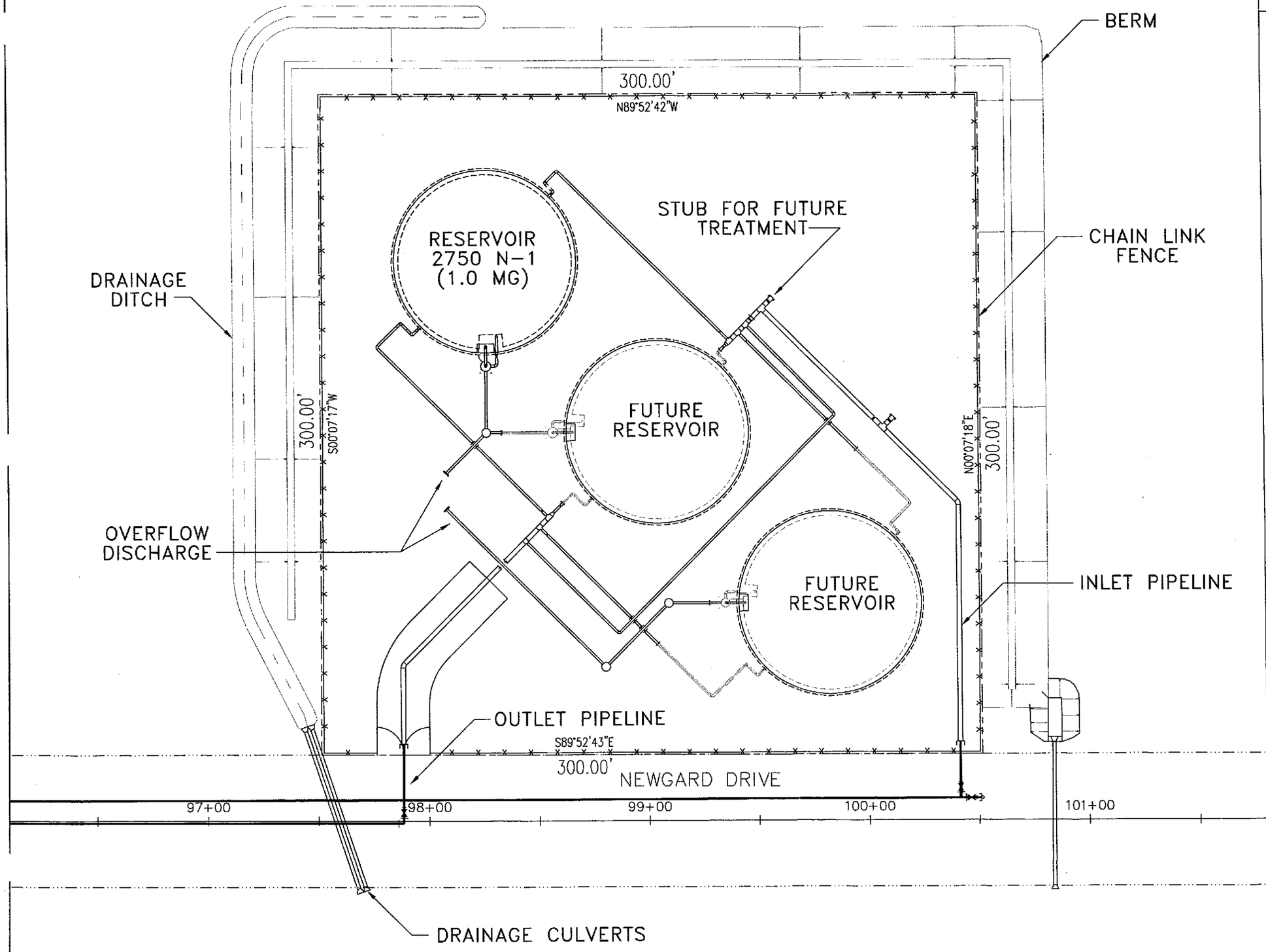
GOLDEN VALLEY RANCH WATER AND SEWER MASTER PLAN



NORTH

GRAPHIC SCALE
25 0 25 50
(IN FEET)
SCALE 1" = 45'

FIGURE 2.4
TYPICAL RESERVOIR SITE
(2750 NORTH SITE)

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3.0 Sanitary Sewer

3.1 *Wastewater Contributions*

The wastewater contributions for the GVR development were calculated similar to the process of water demand calculations, presented in Section 2.1. Calculation spreadsheets for GVR wastewater contributions are presented in Appendix D. Tables 3.1 through 3.3, presented below, summarize the data presented in Appendix D

Table 3.1

Average Day Wastewater Contribution Factors	
Zoning	*Contribution Factor*
Residential Active Adult Average Day Rate	144 gpd/unit
Residential Conventional Average Day Rate	240 gpd/unit
Residential High Density Average Day Rate	168-180 gpd/unit
School Average Day Rate	800 gpd/acre
Commercial Average Day Rate	1,750 gpd/acre

The wastewater contributions for the GVR development are summarized below in Table 3.2.

Table 3.2

GVR Wastewater Contribution Summary				
Land Use Component	*Total Acres*	*Total Units*	*Average Day WW Contribution (mgd)*	*Peak Hour WW Contribution (mgd)*
Active Adult Residential	2,316	12,230	1.76	5.28
Conventional Residential	1,751	8,175	1.96	5.89
High Density Residential	278	12,775	2.27	6.80
School	129.7	N/A	0.10	0.3
Commercial	48.4	N/A	0.08	0.24
Total	**4,523**		**6.17**	**18.51**

Sewage flow peaking factors are 1.2 for maximum month, 2.0 for maximum day, and 3.0 for peak hour. The calculated peak hour flow rate for the development is 18.51 mgd.

3.1.2 Offsite Contributions

There are two offsite areas identified below which are considered in the sizing of GVR sewer pipelines. The City of Kingman is located northeast of the development and is planned to contribute 0.25 mgd on an average day to the southeastern most sewer pipe in the system. The offsite parcels located north of the development, are planned to discharge 1.47 mgd on an average day to a westerly sewer in Shinarump Road. The City of Kingman and other offsite discharge locations are shown on Figure 3.2.

Table 3.3

Offsite Wastewater Contributions[1]				
Offsite Contributor	*Total Acreage*	*Number of Residential Units*	*Total Flow Average Day (mgd)*	*Total Peak Hour Flow (mgd)*
City of Kingman	N/A	N/A	0.25	0.75
North of GVR	1,363	24,534[1]	1.47	4.42
Totals			**1.72**	**5.17**

(1) Assumption for Units = Acres x 75% x 6 units/acre

3.2 *Facility Layout*

3.2.1 Service Area

The proposed GVR Wastewater Collection System is planned to serve approximately 6,300 acres. The service area is composed of the GVR development and approximately 1,360 acres of offsite parcels to the immediate north. In addition, the City of Kingman is considered piping sewage to the GVR system. The sewer service area includes all Rhodes-owned parcels to the north of Shinarump Road within the Golden Valley area.

3.2.2 Offsite Sewer Connections

Offsite sewer connections are presented on Figure 3.2. Connections occur along the northern boundary of the site and at the southeast corner of the site.

3.2.3 Sewer Alignments

GVR sewer alignments are presented on Figures 3.1 and 3.2. The alignments establish the backbone system required to serve all parcels of the GVR development. Figure 3.1 presents the existing site topography in addition to the alignments.

3.2.4 Sewer Crossings

Sewer pipelines crossing drainage washes and golf courses have been identified on Figure 3.2. Further planning will be required once the elevation constraints of the washes and golf course are published. It may be necessary to construct a lift station if wash crossings, particularly along the Thirteen Mile wash, become unfeasible.

3.2.5 Sewer Outfalls

There are two sewer outfalls identified on Figure 3.2. The northern outfall to the 0.24 MGD treatment plant is approximately 2,470 feet above mean sea level. The southern outfall to the 1.0 MGD wastewater treatment plan is approximately 2,403 feet above mean sea level. The NAVD 1988 datum is used.

3.2.6 Wastewater Treatment Plants

There are two wastewater treatment plants identified on Figure 3.2. The northern 0.24 MGD treatment facility is intended to serve the initial wastewater contributions from Golden Valley Ranch Master Planned Community. The southern treatment plant, planned with a 1.0 MGD capacity, will treat Golden Valley Ranch and possibly City of Kingman flow. An expansion to the 1.0 MGD facility, or a regional wastewater treatment facility will serve the remaining contributions of Golden Valley Ranch.

3.3 *Sanitary Sewer Design Criteria*

3.3.1 Operational Requirements

The operational requirements in conjunction with the peak flow rates are used to adequately design and size a wastewater collection system. Pertinent requirements for gravity sewers and manholes are presented in the tables below.

Table 3.4

Gravity Sewer Design Criteria	
Design Parameter	*Requirement*
Minimum Pipe Diameter	8 inches
Minimum Pipe Slope	S = 0.004 ft/ft
Minimum Velocity	2.0 fps @ 1/2 full
Maximum Depth to Diameter Ratio	d/D = 0.75
Manning's Friction Coefficient	n = 0.013

Table 3.5

Manhole Spacing Criteria	
Pipe Diameter	*Max Distance Between Manholes*
8" to 12"	450 feet
12" to 18"	500 feet
18" and Greater	670 feet

3.4 *Sewer Collector Model*

3.4.1 Model Development

The GVR sewer model was developed based on preliminary finished grades and the alignments presented on Figure 3.1. Manhole rim elevations were obtained from existing grades and pipe inverts were set at a minimum, six (6) feet below rim elevation. Lower inverts were necessary in areas where minimum slope requirements (S=0.004 ft/ft) were not met. Wastewater contributions were inserted into appropriate manholes at the highest potential connection point for the contribution. The sewer contributions, presented in Appendix D, identify all GVR contributions and the respective H_20Map Sewer manhole ID where the flows were inserted into the model. The model did not peak the average flowrates, average and peak flows were inserted independently. Pipe sizes were established by using a non-attenuated peak flow.

3.4.2 Model Requirements

The model was run and output was compared. Pipe segments with depth to diameter (d/D) ratios greater than 0.75 were identified, and either invert elevations or pipeline diameters were adjusted to achieve a d/D ratio of less than 0.75 during peak hour flow conditions. This iterative process continued until all pipes met this requirement. In addition to diameter changes, some invert elevations were also adjusted to attain the required capacities and slopes.

3.4.3 Model Output

Model output is presented in Appendix D. Manhole and pipe reports for average day and peak hour scenarios are presented in the appendix. The data can be compared with the operational requirements presented in Section 3.2.1.

3.4.4 Proposed Collection Plan

The proposed wastewater collection system for GVR is presented on Figure 3.2. Pipe diameters are identified. Offsite contribution locations and discharge locations are also presented. All parcels and contributors are served with the proposed collection system.